

## Predicting Effects of Climate Change, with Kristie Ebi

Ernie Hood

How do you visualize something you've never seen? That's the question facing policy makers who are charged with preparing for the potential public health effects of a warming climate. In this podcast, Kristie Ebi looks at various scenarios used to power models that predict effects of climate change. Ebi is the author of "Climate change, tropospheric ozone and particulate matter, and health impacts" and an independent consultant who has served on numerous scientific panels including the Intergovernmental Panel on Climate Change.

**AHEARN:** It's *The Researcher's Perspective*. I'm Ashley Ahearn.

Much study has been dedicated to figuring out how climate change will affect global water supplies and ecosystems. We know that as temperatures on the planet rise, droughts and wildfires are likely to become more common. Ocean chemistry is already changing. Many species could go extinct. But where do people fit into that equation?

Dr. Kristie Ebi serves on the Intergovernmental Panel on Climate Change<sup>i</sup> and is an authority on the potential impacts of climate change on human health.

In this edition of *The Researcher's Perspective*, Dr. Ebi talks with science writer Ernie Hood about a review article she coauthored in *Environmental Health Perspectives*.<sup>ii</sup> The article looked at ways climate change will affect the Earth's ozone and particulate matter levels—and what that could mean for human health.

**HOOD:** Dr. Ebi, welcome to *The Researcher's Perspective*.

**EBI:** Thank you. It's a pleasure to talk with you.

**HOOD:** You reviewed dozens of studies modeling the potential impact of climate change on human health. Could you briefly summarize for us what you found?

**EBI:** The studies used a fairly small set of scenarios, and the scenarios are used to run the climate models. The scenarios tell us things like how many people there'll be in the world, where they're going to live, how wealthy they're going to be, what kind of technologies they're going to use. From those, one can then determine how many

greenhouse gases will likely be emitted, which are put into the climate models to tell us how much temperature would change.

**HOOD:** What is the outlook for potential increases in ozone levels as the planet gets warmer over the next century? And along the same line, what are the implications of those increases for adverse effects on human morbidity and mortality?

**EBI:** These studies all assume that you hold emissions constant because that is one of the sources of uncertainty in looking at these studies. And that means how well will we control emissions from power plants and tailpipes? And if we assume current levels of control—we don't change that over time—then as the temperatures warm, and if the degree of cloudiness remains the same so we have the same number of clear, cloudless days, then ozone concentrations would be expected to increase. And as they increase, people who have a whole range of cardiorespiratory diseases, from asthmatics to people with cardiovascular disease, find that extra concentration of ozone in the atmosphere stressful. So it does lead to higher morbidity. It leads to more hospitalizations, and it leads to increased numbers of deaths.

**HOOD:** What about the projected situation with regard to particulate matter?

**EBI:** Particulate matter has been significantly less well studied, and it's more complicated because certainly in northern regions, the U.S. and Europe, what we've seen over the last century is a 20 percent increase in heavy precipitation events. We see the same number of rainy days; when it rains, it rains harder. When it rains harder, it tends to wash the particulates out of the sky, basically. And trying to project from the climate model side what's going to happen with those heavy precipitation events is much more difficult than projecting what's going to happen with temperature. So people are trying to understand how they could model what would happen with particulate matter and thinking of ways that they can incorporate this change in raininess and what the consequences might be.

The Environmental Protection Agency [EPA] has been funding some research looking at the atmospheric chemistry around this very issue.

**HOOD:** What do you see as the main take-home message of this paper?

**EBI:** The message is, if we hold emissions constant—because that’s a significant source of uncertainty—that, all else being equal, climate change is likely to make it more difficult for communities to try and reach their ozone standards. It will adversely affect people in the community. It will place a greater burden on health care. It will place a greater burden on the public health infrastructure. So it will be something that I think could potentially be important given all of the uncertainties about these kinds of projections. But certainly it is something that EPA is thinking about how they could possibly handle, and cities need to think about what they would do and what are the options for them to try and reduce precursor emissions to help protect the health and safety of their populations.

Looking across all of the possible health outcomes that could be affected by climate change, we also need to adapt. We need to look at what kinds of things can be done to help people adjust to the changes. Do we need additional regulations in this case? Do we need to change our regulations? Do we need to think about, for example, when kids go outside? Do we want to make changes so that there is less exposure, perhaps, to ozone? Are there ways that we can make adjustments now that would help people cope with higher ozone concentrations, at the same time reducing the precursor emissions so that less ozone would be formed in the first place?

**HOOD:** What is the best direction for the research to take at this point to provide us with the answers we most urgently need?

**EBI:** Right now, although there have been a number of studies projecting what could happen with ozone, they’re in very limited geographic areas, and we do need to understand how ozone could change across a variety of geographic areas to provide more local-scale information for decision makers.

We talked about particulate matter; there’s lots of uncertainty about what might happen with particulate matter. Very few studies have taken a look at this. So more research needs to be done on how those could interact.

There obviously needs to be research on—not only from the health perspective but from other sectors’ perspective—of what are the options for reducing the emissions that lead to ozone.

I know there’s a lot of technology development going on. There’s other ways that we may be able to explore to reduce those emissions as quickly as we can, and that’s all the way from the technology to getting people to do things like walking more, which would help from a whole range of health perspectives, not using their automobiles quite so much. And how do we communicate that—that the public needs to understand these potential risks, understand what kinds of actions that they and their governments need to take? How do we best communicate so that we can motivate the right kinds of changes?

And I think the more that people engage and think about how to deal with climate change, the more possibilities we have of finding the solutions that will help us in the short and in the long term.

**HOOD:** Dr. Kristie Ebi, thank you so much for joining us on this edition of *The Researcher’s Perspective*.

**EBI:** Thank you.

**AHEARN:** That was Dr. Kristie Ebi talking with science writer Ernie Hood. And that’s *The Researcher’s Perspective*. I’m Ashley Ahearn. Thanks for downloading!

**Ernie Hood** is a science writer, editor, and podcast producer in Hillsborough, North Carolina. He also produces and hosts the weekly science radio show *Radio in Vivo*.

## References

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<sup>i</sup> Working Group II Home [webpage]. Stanford, CA:Technical Support Unit, IPCC WG II, Intergovernmental Panel on Climate Change. Available: <http://www.ipcc-wg2.gov/> [accessed 25 August 2010].

<sup>ii</sup> Ebi KL, McGregor G. Climate Change, Tropospheric Ozone and Particulate Matter, and Health Impacts. *Environ Health Perspect* 116:1449–1455 (2008); doi:10.1289/ehp.11463.